

# Navigation using Deep-Space Optical Communication Systems (OptComNav)

Completed Technology Project (2015 - 2018)



## Project Introduction

Investigate the use of optical communication links for deep-space navigation. Determine whether optical-communication-based tracking can fulfill the navigation needs of a range of missions, and what are the advantages and disadvantages when compared with alternative approaches.

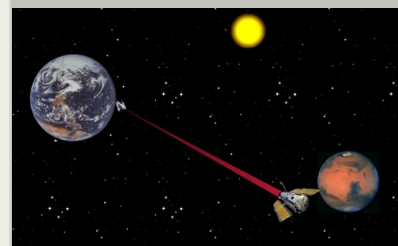
This task will determine the navigation performance that is possible using the envisioned optical communications infrastructure, assessing the mission scenarios for which adequate navigation performance can be achieved. The goal is to determine the conditions under which a mission carrying an optical communications terminal need not also carry a second radio frequency transponder – thereby saving mass, power, and cost – in consequence reducing the complexity of the spacecraft and mission operations. Using JPL's operational navigation software we will develop a set of simulations to assess optical navigation performance, using realistic estimates for the performance of future on-board and ground-based optical terminals. We will consider a suite of missions, with increasingly demanding navigation requirements, to understand under what conditions optical navigation performance would be sufficient.

## Anticipated Benefits

Lower cost if there is no need to carry a second tracking system in addition to the optical communication terminal.

These methods could also be used by commercial operators either in Earth orbit or in deep-space.

These methods may also be applicable to navigate Earth-orbiting spacecraft operated by other Government Agencies.



Notional spacecraft equipped with an optical terminal performing optical range from its orbit around Mars with a ground optical terminal on Earth.

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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Jet Propulsion Laboratory (JPL)	Lead Organization	NASA Center	Pasadena, California

### Primary U.S. Work Locations

California

## Organizational Responsibility

### Responsible Mission Directorate:

Mission Support Directorate (MSD)

### Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

### Responsible Program:

Center Independent Research & Development: JPL IRAD

## Project Management

### Program Manager:

Fred Y Hadaegh

### Project Manager:

Fred Y Hadaegh

### Principal Investigator:

Tomas J Martin-mur

### Co-Investigators:

Reza R Karimi

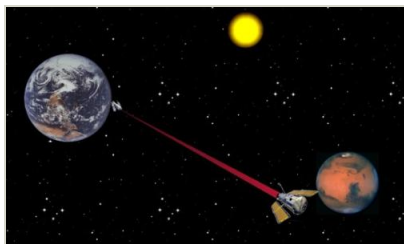
Sarah E Mccandless

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## Images



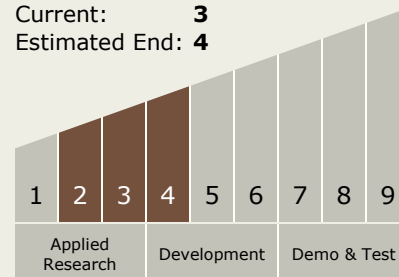
### Interplanetary optical ranging

Notional spacecraft equipped with an optical terminal performing optical range from its orbit around Mars with a ground optical terminal on Earth.

(<https://techport.nasa.gov/image/26006>)

## Technology Maturity (TRL)

Start: 2  
Current: 3  
Estimated End: 4



## Technology Areas

### Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.1 Optical Communications
    - TX05.1.6 Optometrics

## Target Destinations

Earth, Others Inside the Solar System, Foundational Knowledge

## Supported Mission

### Type

Push